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November 24, 1999

**BOX PATENT APPLICATION**  
Assistant Commissioner for Patents  
Washington, D.C. 20231

Re: Application of **Jean-Pierre BONICEL**

**A STRUCTURALLY-REINFORCED CABLE FOR TRANSPORTING POWER  
AND/OR FOR TELECOMMUNICATIONS**  
Our Ref. Q56881

Dear Sir:

Attached hereto is the application identified above including 7 sheets of the specification, claims and abstract, 1 sheet of formal drawings, executed Assignment and PTO 1595 form, and executed Declaration and Power of Attorney. Also enclosed is the Information Disclosure Statement.

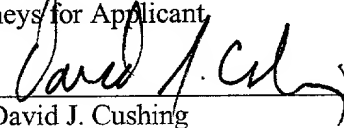
The Government filing fee is calculated as follows:

Total claims	<u>5</u> - 20	=	<u>0</u>	x	\$18.00	=	<u>\$0.00</u>
Independent claims	<u>1</u> - 3	=	<u>0</u>	x	\$78.00	=	<u>\$0.00</u>
Base Fee							\$760.00
<b>TOTAL FILING FEE</b>							<b>\$760.00</b>
Recordation of Assignment							\$40.00
<b>TOTAL FEE</b>							<b>\$800.00</b>

Checks for the statutory filing fee of \$760.00 and Assignment recordation fee of \$40.00 are attached. You are also directed and authorized to charge or credit any difference or overpayment to Deposit Account No. 19-4880. The Commissioner is hereby authorized to charge any fees under 37 C.F.R. §§ 1.16 and 1.17 and any petitions for extension of time under 37 C.F.R. § 1.136 which may be required during the entire pendency of the application to Deposit Account No. 19-4880. A duplicate copy of this transmittal letter is attached.

Priority is claimed from December 31, 1998 based on FRENCH Application No. 9816710. The priority document is enclosed herewith.

Respectfully submitted,  
SUGHRUE, MION, ZINN,  
MACPEAK & SEAS, PLLC  
Attorneys for Applicant

By:   
David J. Cushing  
Registration No. 28,703

A STRUCTURALLY-REINFORCED CABLE FOR TRANSPORTING POWER  
AND/OR FOR TELECOMMUNICATIONS

The present invention relates to cables for transporting power and for telecommunications, and that have been structurally reinforced by incorporating at least one reinforcing wire and/or armoring made up of one or more layers of wire.

BACKGROUND OF THE INVENTION

In conventional manner, numerous power transport cables and telecommunications cables are structurally reinforced in order to enable them better to withstand the physical stresses that might be applied to them in the medium in which they are installed. In overhead cables, this leads to one or more reinforcing wires being associated with the electrically conductive wires and/or with the light-transmitting waveguides in order to improve the performance of such cables in mechanical terms, and in particular in terms of breaking strength. In similar manner, it is conventional to provide mechanical reinforcement for land cables, in particular those which are designed to be buried, and also for underwater cables, by means of armoring made up of one or more layers of wires that are mechanically stronger than the electrically conductive wires and/or the transmission waveguides that the armoring surrounds.

The reinforcing wires and the armoring wires of power transport cables and of telecommunications cables can be made of stainless steel so as to take advantage of the mechanical qualities that can be obtained with such steels and also of their ability to withstand corrosion. A high degree of resistance to corrosion is essential, in particular for undersea cables which are placed in a corrosive medium, and also for underground cables and overhead cables that are subjected to difficult climatic constraints. Thus, document EP-A-710862 describes an undersea optical fiber cable having stainless steel reinforcing wires.

Nevertheless, the use of stainless steel for making reinforcing wires or armoring wires gives rise to a significant increase in the cost of such cables, and less expensive substitute solutions are therefore being  
5 sought.

It is known to replace stainless steel wires with other wires, in particular galvanized steel wires or steel wires protected by an aluminum coating, for the purpose of reducing cost. Nevertheless, the resulting  
10 resistance to corrosion is considerably less and the way hydrogen can be given off, particularly from galvanized steel wires, means that such wires cannot be used to make the cores of optical fiber cables for telecommunications.

#### OBJECT AND SUMMARY OF THE INVENTION

15 The invention therefore proposes a power transport cable or a telecommunications cable that is structurally reinforced by incorporating at least one reinforcing wire and/or armoring having one or more layers of wires.

According to a characteristic of the invention, the  
20 cable has at least one reinforcing or armoring wire made of composite steel having a steel core of standard type, and covered in a layer of stainless steel.

According to a characteristic of a variant of the invention, the cable has at least one layer of armoring  
25 constituted by composite steel wires.

According to a characteristic of a variant of the invention, the cable has at least one reinforcing wire or armoring wire constituted by composite steel sold under the registered trademark NUOVINOX.

30 According to a characteristic of a variant of the invention, the cable has a tube obtained from a sheet constituted by composite steel having a core of a standard type of steel covered in a layer of stainless steel.

35 According to a characteristic of a variant of the invention, the cable has a tube constituted by a

composite steel sold under the registered trademark NUOVINOX.

#### BRIEF DESCRIPTION OF THE DRAWING

The invention, its characteristics, and its advantages are described in the description below with reference to the following figures:

- Figure 1 is a cross-section view of an example of a telecommunications cable of reinforced structure; and

- Figure 2 is a view of a segment of a power transport cable of reinforced structure.

#### MORE DETAILED DESCRIPTION

The telecommunications cable shown by way of example in cross-section in Figure 1 is an overhead optical fiber cable, known as an optical guard cable, of the kind used in high voltage electricity distribution networks for remote surveillance, remote control, and/or telecommunications purposes. It is designed to be carried by the pylons of the electrical power transport grid and consequently it can be subjected to severe climatic conditions.

The guard cable has a central reinforcing wire 1 around which tubes 2 are laid, each housing a group of optical fibers 3. The laid tubes are then placed between the central reinforcing wire 1 and a holding tube 4. This tube is usually made of metal, of metal alloy, or of a plastics material.

The tubes 2 are laid either parallel to the central reinforcing wire 1, or else they are wound helically thereabout.

Armoring is placed around the holding tube 4. In this case it is made up of two layers of wires 5 and 6 that touch each other and that are of different diameters in the two layers.

In accordance with the invention, at least some of these armoring wires are made of a composite steel. Wires made of composite steel may optionally be interposed between wires made of aluminum alloy. The

outer layer of armoring can also be made entirely out of aluminum alloy. Each composite steel wire has a core 5A or 6A made out of a standard type of steel and covered in a layer 5B or 6B of stainless steel. The same applies in this case to the central reinforcing wire 1 which comprises a core 1A covered in a layer 1B.

By way of example, the composite steel used is a steel manufactured by STELAX under the registered trademark NUOVINOX, it is obtained from tubes of stainless steel filled with ground steel particles which are compressed under high pressure inside the tubes. The billets obtained from such tubes are then placed in a furnace which is raised to a temperature of 1250°C, after which they are drawn into the form of wires of respective sections corresponding to those desired for the reinforcing wires and/or the armoring wires.

This makes it possible to obtain wires whose peripheries withstand corrosion as well as a wire made of solid stainless steel, but to do so at a cost that is considerably lower. The stainless steel layer on the composite steel wire corresponds, for example, to a skin having a thickness of 0.5 mm. The core of a composite steel wire can optionally have mechanical strength that is greater than that of the stainless steel, for example if the core is made out of a high strength carbon steel.

In the example of a cable shown in Figure 1, it is assumed that the central reinforcing wire 1 and the wires 5 and 6 in the armoring layers are made out of composite steel so as to benefit both from the advantages concerning mechanical strength that are provided by said steel and from the absence of any hydrogen being given off which is desirable because of the presence of optical fibers in the cable.

Naturally, it is possible to make other telecommunications cables in which advantage can be taken of using a composite steel for reinforcing wires or for armoring wires, and in particular telecommunications

cables having wires or coaxial waveguides of electrically conductive material for transmitting signals in electrical form.

Figure 2 shows an example of a segment of armored power distribution cable which comprises in its center three multistrand power distribution conductors 7, e.g. made of copper, each of said conductors being covered in an insulating sheath 8. The assembly is housed in a sheath 9 which forms a cushion, and which is covered by a sheet 10 that optionally be made of a composite steel such as NUOVINOX.

The tube formed by the sheet 10 is itself covered in a layer of armoring, in this case a single layer, constituted by wires 11 that are laid parallel with or helically around the tube. At least some of the armoring wires are made of composite steel, and preferably of NUOVINOX, for mechanical reinforcement purposes, like the armoring of the telecommunications cable shown in Figure 1.

## CLAIMS

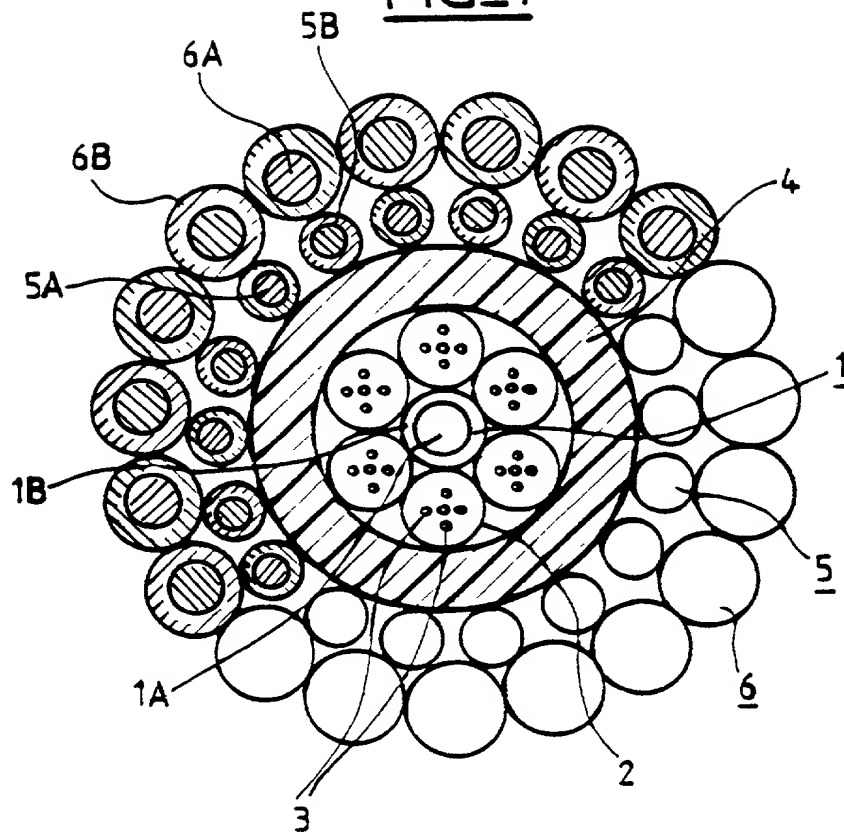
- 1/ A telecommunications or power transport cable that is structurally reinforced by incorporating at least one reinforcing wire or armoring having one or more layers of wires, the cable including at least one reinforcing wire or armoring wire that is made of composite steel having a core of steel of a standard type, and covered in a layer of stainless steel.
- 2/ A telecommunications or power transport cable according to claim 1, in which at least one layer of armoring is constituted by composite steel wires.
- 3/ A telecommunications or power transport cable according to claim 1, including at least one reinforcing wire or armoring wire made of composite steel sold under the registered trademark NUOVINOW.
- 4/ A telecommunications or power transport cable according to claim 1, in which a tube is provided that is obtained from a sheet made of composite steel having a steel core of a standard type covered in a layer of stainless steel.
- 5/ A telecommunications or power transport cable according to claim 4, in which a tube is made of composite steel as sold under the registered trademark NUOVINOX.

## A B S T R A C T

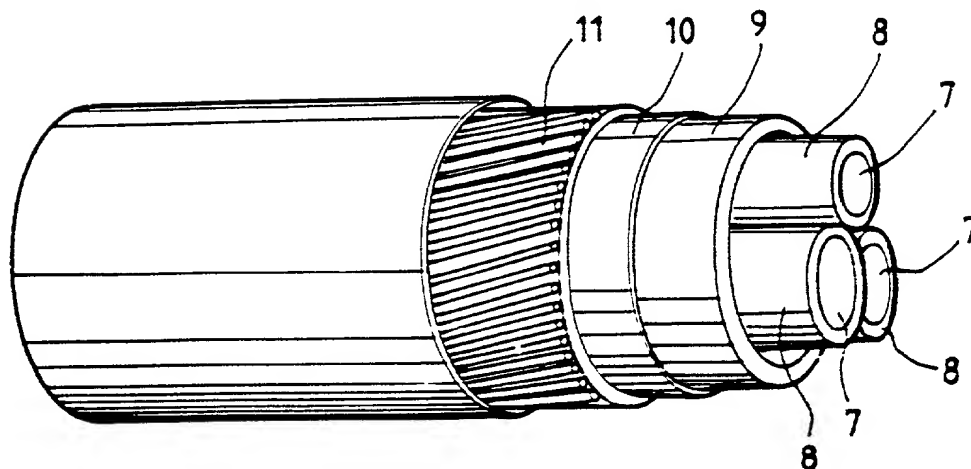
A telecommunications or power transport cable is structurally reinforced by incorporating at least one reinforcing wire or armoring comprising one or more  
5 reinforcing wire or armoring comprising one or more layers of wires. The cable includes at least one reinforcing wire or armoring wire and/or optionally a tube made out of a composite steel having a steel core of a standard type covered in a layer of stainless steel.



FIG\_1



FIG\_2



# Declaration and Power of Attorney for Patent Application

## Déclaration et Pouvoirs pour Demande de Brevet

### French Language Declaration

En tant que l'inventeur nommé ci-après, je déclare par le présent acte que:

As a below named inventor, I hereby declare that:

Mon domicile, mon adresse postale et ma nationalité sont ceux figurant ci-dessous à côté de mon nom.

My residence, post office address and citizenship are as stated next to my name.

Je crois être le premier inventeur original et unique (si un seul nom est mentionné ci-dessous), ou l'un des premiers co-inventeurs originaux (si plusieurs noms sont mentionnés ci-dessous) de l'objet revendiqué, pour lequel une demande de brevet a été déposée concernant l'invention de la description identifiée par le numéro de référence

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention in the specification identified by Docket No.

102006/VF/TEL

Je déclare par le présent acte avoir passé en revue et compris le contenu de la description ci-dessus, revendications comprises.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims.

Je reconnais devoir divulguer toute information pertinente à la brevetabilité, comme défini dans le Titre 37, § 1.56 du Code fédéral des réglementations.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56.

Je revendique par le présent acte avoir la priorité étrangère, en vertu du Titre 35, § 119(a)-(d) ou § 365(b) du Code des Etats-Unis, sur toute demande étrangère de brevet ou certificat d'inventeur ou, en vertu du Titre 35, § 365(a) du même Code, sur toute demande internationale PCT désignant au moins un pays autre que les Etats-Unis et figurant ci-dessous et, j'ai aussi indiqué ci-dessous toute demande étrangère de brevet, tout certificat d'inventeur ou toute demande internationale PCT ayant une date de dépôt précédant celle de la demande à propos de laquelle une priorité est revendiquée.

I hereby claim foreign priority under Title 35, United States Code, § 119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT International application which designated at least one country other than the United States, listed below, and have also identified below any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed.

Prior foreign application(s) for which priority is claimed  
Demande(s) de brevet étrangère(s) antérieure(s) dont la priorité est revendiquée

(Number) (Numéro)	(Country) (Pays)	(Day/Month/Year Filed) (Jour/Mois/Année de dépôt)
98 16 710	FRANCE	31 DECEMBER 1998

Prior foreign applications for which priority is not claimed  
Demande(s) de brevet étrangères antérieure(s) dont la priorité n'est pas revendiquée

(Number) (Numéro)	(Country) (Pays)	(Day/Month/Year Filed) (Jour/Mois/Année de dépôt)

## French Language Declaration

Je revendique par le présent acte tout bénéfice, en vertu du Titre 35, § 119(e) du Code des Etats-Unis, de toute demande de brevet provisoire effectuée aux Etats-Unis et figurant ci-dessous.

I hereby claim the benefit under Title 35, United States Code, § 119(e) of any United States provisional application(s) listed below.

(Application No.)  
(No de demande)

(Filing Date)  
(Date de dépôt)

Je revendique par le présent acte tout bénéfice, en vertu du Titre 35, § 120 du Code des Etats-Unis, de toute demande de brevet effectuée aux Etats-Unis, ou en vertu du Titre 35, § 365(c) du même Code, de toute demande internationale PCT désignant les Etats-Unis et figurant ci-dessous et, dans la mesure où l'objet de chacune des revendications de cette demande de brevet n'est pas divulgué dans la demande antérieure américaine ou internationale PCT, en vertu des dispositions du premier paragraphe du Titre 35, § 112 du Code des Etats-Unis, je reconnais devoir divulguer toute information pertinente à la brevetabilité, comme défini dans le Titre 37, § 1.56 du Code fédéral des réglementations, dont j'ai pu disposer entre la date de dépôt de la demande antérieure et la date de dépôt de la demande nationale ou internationale PCT de la présente demande.

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s), or § 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application.

(Application No.)  
(N0 de demande)

(Filing Date)  
(Date de dépôt)

(Status)(patented, pending, abandoned)  
(Statut)(breveté, en cours d'examen, abandonné)

Je déclare par le présent acte que toute déclaration ci-incluse est, à ma connaissance, véridique et que toute déclaration formulée à partir de renseignements ou de suppositions est tenue pour véridique; et de plus, que toutes ces déclarations ont été formulées en sachant que toute fausse déclaration volontaire ou son équivalent est passible d'une amende ou d'une incarcération, ou des deux, en vertu de la Section 1001 du Titre 18 du Code des Etats-Unis, et que de telles déclarations volontairement fausses risquent de compromettre la validité de la demande de brevet ou du brevet délivré à partir de celle-ci.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

# French Language Declaration

PQVOIRS: En tant que l'inventeur cité, je désigne par la présente l'(les) avocat(s) et/ou agent(s) suivant(s) pour qu'ils poursuive(nt) la procédure de cette demande de brevet et traite(nt) toute affaire s'y rapportant avec l'Office des brevets et des marques: (mentionner le nom et le numéro d'enregistrement).

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith: (list name and registration number)

John H. Mion, Reg. No. 18,879; Thomas J. Macpeak, Reg. No. 19,292; Robert J. Seas, Jr., Reg. No. 21,092; Darryl Mexic, Reg. No. 23,063; Robert V. Sloan, Reg. No. 22,775; Peter D. Olexy, Reg. No. 24,513; J. Frank Osha, Reg. No. 24,625; Waddell A. Biggart, Reg. No. 24,861; Louis Gubinsky, Reg. No. 24,835; Neil B. Siegel, Reg. No. 25,200; David J. Cushing, Reg. No. 28,703; John R. Inge, Reg. No. 26,916; Joseph J. Ruch, Jr., Reg. No. 26,577; Sheldon I. Landsman, Reg. No. 25,430; Richard C. Turner, Reg. No. 29,710; Howard L. Bernstein, Reg. No. 25,665; Alan J. Kasper, Reg. No. 25,426; Kenneth J. Burchfiel, Reg. No. 31,333; Gordon Kit, Reg. No. 30,764; Susan J. Mack, Reg. No. 30,951; Frank L. Bernstein, Reg. No. 31,484; Mark Boland, Reg. No. 32,197; William H. Mandir, Reg. No. 32,156; Scott M. Daniels, Reg. No. 32,562; Brian W. Hannon, Reg. No. 32,778; Abraham J. Rosner, Reg. No. 33,276; Bruce E. Kramer, Reg. No. 33,725; Paul F. Neils, Reg. No. 33,102; and Brett S. Sylvester, Reg. No. 32,765; and Robert M. Masters, Reg. No. 35,603.

Adresser toute correspondance à:

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Signature de l'inventeur	Inventor's signature <i>Jean Pierre Bonicel</i>
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Nationalité	Citizenship French
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Nom complet du second co-inventeur, le cas échéant	Full name of second joint inventor, if any (First Middle Last)
Signature du second inventeur	Second inventor's signature
Date	Date
Domicile	Residence
Nationalité	Citizenship
Adresse postale	Post Office Address

(Fournir les mêmes renseignements et la signature de tout co-inventeur supplémentaire.)

(Supply similar information and signature for third and subsequent joint inventors.)